PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : D21D 1/02

A1

(11) International Publication Number: WO 99/43886

(43) International Publication Date: 2 September 1999 (02.09.99)

(21) International Application Number: PCT/FI99/00143

(22) International Filing Date: 23 February 1999 (23.02.99)

(30) Priority Data:
980418 24 February 1998 (24.02.98) FI

(71) Applicant *(for all designated States except US)*: POM TECHNOLOGY OY AB [FI/FI]; Georgsgatan 30, FIN-00100 Helsingfors (FI).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: MEINANDER, Paul, Olof [FI/FI]; Bolagsgränden 2, FIN-02700 Grankulla (FI).

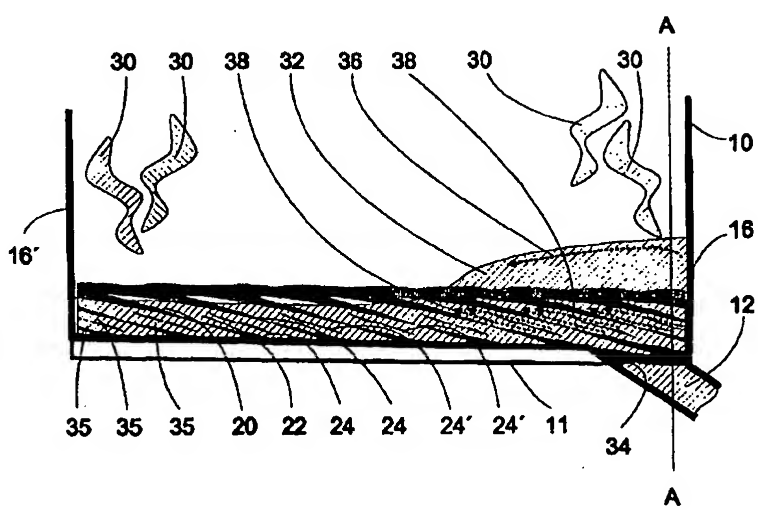
(74) Agent: BORENIUS & CO. OY AB; Folkskolegränd 3, FIN-00100 Helsingfors (FI).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.
In English translation (filed in Swedish).

(54) Title: A METHOD AND AN APPARATUS FOR TREATING A FLUID MASS



(57) Abstract

The invention relates to methods and an arrangement for treating a fluid mass or stock (32), especially couch stock or the like in paper making, where stock material (30) is fed to a vessel (10) having a mixing arrangement comprising rotatably arranged processing means (20). At least two processing means are brought to rotate mutually adjacent in opposite directions and essentially horizontally. The stock (32) at the upper surface of said means (20) is conveyed towards a wall portion (11) of said vessel (10), whereby spirals (24, 24') arranged in an inclined manner at a core (22) of said processing means bring said stock (32) into channels (34, 35) defined by said core (22), by said spirals (24, 24') and by said wall portion (11) of said vessel (10), and further towards a constriction formed by the respective spiral elements (24, 24') running in an intermeshed manner, while a part of said stock is forced in a direction away from a discharge (12) of said vessel (10).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

A method and an apparatus for treating a fluid mass

The invention generally relates to methods and arrangements according to the preamble to the appended claims. Especially the invention relates to methods for treating a fluid mass or stock and especially a method for treating a couch mass or the like, wherein the mass or stock material is fed to a vessel or trough having a mixing device comprising rotatably arranged processing means. The invention also relates to a processing arrangement for a fluid mass or stock, said arrangement comprising a vessel or trough for receiving said mass or stock, a processing device arranged in said vessel and comprising horizontally arranged rotatable cylinder body means with spirals, as well as a discharge for treated mass or stock. The invention further relates to a specific use of the method and the arrangement.

In paper manufacturing trimmed strips are cut from the wet web, and additionally wet broke material will be generated at the wire and the press section in connection with a web break. Usually the wet broke material is collected, disintegrated and diluted in a pulper comprising a container with a powerful mixing feature and thereafter it is returned to the process.

For the disintegration to function properly the pulper must comprise a sufficient amount of mass or stock which is kept under a powerful mixing by the disintegration means of the pulper. During regular processing the amount of stock brought to the pulper corresponds to a minor part of a paper machine's production. At web breaks, changes of quality and machine stops the amount of stock may temporarily rise to an amount corresponding to the total production capacity of the machine.

In order to achieve a satisfactory mixing and disintegration effect the stock in the pulper must be kept highly diluted and a sufficient great volume of mass must be kept therein. This

leads to a high power demand for the disintegration and mixing.

At a web break the water consumption rises greatly and for this purpose a water reserve must be arranged corresponding to the demand at a typical web break. After the disintegration the wet broke material usually is de-watered in a separate de-watering device for better correspondence with the productional consistency and for retrieving the water therefrom.

At productional changes, especially at a change of color, there will exist a large amount of wet broke material from the earlier paper quality, which amount cannot be used for the next quality. The wet broke material in circulation in the system will also make the attaining of the new paper quality slower and results in productional losses and change-over broke masses.

In this respect it is also of importance that the pulper can be easily and completely emptied of its contents, which is not the case for typical pulpers.

Many paper machines have a low and narrow wire section which does not provide space for the construction of an appropriate pulper. In this case vaulting and broke stocking problems will arise and the pulper itself can be difficult to maintain and service.

Corresponding problems occur in other productions where a mass or different streams of components should be processed in order to achieve a homogenous mass.

Usually the wet broke mass is diluted to a 2 to 3 percent consistency in a couch pit or wire pulper. Depending on the structure of the paper machine a similar pulper may also be arranged in connection with the press section. Depending on the size of the machine the wire pulper is typically between

five and fifty cubic meters and it comprises a powerful mixer which breaks up fibre bundles and pieces of paper. For an effective function the pulper requires a good mixing which, in turn, requires a sufficient dilution. Since the pulper works under varying conditions the dilution usually is over-dimensioned according to the most critical situation.

Publication No. SE-210862 describes a device for processing a material mass in particulate or suspension form, especially for de-fibration of a cellulose material, at which device at least two band spirals are arranged mutually adjacent in a shell having inlet and outlet openings, said spirals being arranged for spaced intermeshed common rotation. Their spiral surfaces are directed generally radially.

Since the device known from said document has defined inlet and outlet openings and a mainly unbroken axial path of flow it is unsuitable for processing a broke mass which will fall down over the whole width of a paper machine. The axial spiral surfaces give a processing of said mass in an axial direction, and the mixing of mass which takes place does so because the band spirals will cut through the mass, which means only a local turbulence and permits the mass to stagnate within the device. A clearance between said band spirals and said shell has also been provided in order to permit this kind of mixing, and separate screws take care of the feeding of the mass through said outlet.

U.S. Patent No. 2,797,623 discloses a worm conveyor by which broke mass can be transported out from a paper machine. Said worm conveyor comprises a screw in which the broke in a traditional manner is brought along a flute. For this transport to function the spiral surfaces of said screw must be arranged essentially radially. Broke falling into the conveyor will thereby be transported straight through the conveyor without any significant mixing.

Publication No. DE-401033 discloses a mixing and transport arrangement having two intermeshed band spirals. Since they are rotating against each other, the material transported by them will be processed in an alternating manner by one or the other of the spirals and thereby a mixing action will be generated. Said mixing action thus comprises the spirals moving through the material to be mixed and simultaneously transporting it forwards. A mixing in this kind of agitator requires an easy flowing material and there is a risk, if the screws fill up, for a standing circulation to be caused, since the material can easily flow through hollow portions in the spirals.

Especially in small old paper machines the agitator in the couch pit has been formed as a spiral, with the idea of its pressing the broke material towards the outlet of the couch pit. These spirals, however, have been inefficient therein that they have not ground up the broke and have not provided a sufficient power, and thus the broke has been able to vault and block the outlet.

From the pulper the broke is usually transported via a thickener to the machine's stock chest where it is mixed with fresh stock. This can be arranged in many ways, depending on the machine's product and equipment. It is usual to combine the thickening of broke with the recovering of fibers in a disk or drum filter.

At a change of quality the broke can be directed to separate collecting tanks from which it is gradually dosed into the stock. In many cases, especially in the manufacturing of colored paper the broke generated at a change of quality cannot any more be added to the process but will be directed to the waste water treatment where the solid material is recovered for incineration or deposition on a waste dump.

Usually the generated broke will be struck from the wire by

high pressure water which simultaneously dilutes the broke. There has, however, been developed methods for mechanically dislocating broke, one method used including feeding it over a guiding roll having a doctor blade. Hereby the desire has been to avoid an unnecessary dilution of the broke. There is, however, the problem that broke of a higher consistency tends to vault, which is accentuated by a more difficult mixing.

The object of the present invention is to provide a method and an arrangement for an efficient continuous homogenization of a mass flow, for example wet broke in a paper machine or another fluid mass comprising more or less solid components which are to be disintegrated and/or mixed into a liquid type fluid.

One object of the invention is to minimize the processed amount of mass, which minimizes the loss of time and material at a change and shutdown of the process.

An object of the invention is also to provide a method for handling for example wet broke of high consistency, due to which the need for diluting water and a subsequent thickening is eliminated.

A further object of the invention is to provide a vaulting and blocking free handling of for example broke also in narrow spaces.

A further object of the invention is to provide a energy saving method for handling of for example wet broke.

One object of the invention is to provide an apparatus capable of treating for example wet broke in a small volume and one which permits a simple and complete emptying of the same.

One object of the invention is also to provide an apparatus capable of treating for example broke of a high and varying consistency.

One further object of the invention is to provide an apparatus of small dimensions which also in narrow spaces is capable of treating for example broke without a risk for vaulting and blocking.

One further object of the invention is to provide an apparatus which under a low energy consumption treats for example broke.

According to the invention the set objects are reached by arranging, in a vessel, a system comprising spiral means operating counter to each other and in an intermeshing fashion in such a manner that the mass at the vessel's wall will reside in channels formed by said spirals, whereby said mass at the intermesh of said spirals will be pressed into a direction which differs from the traditional direction of transportation for said spirals. Specifically the invention is characterized by the features disclosed in the appended claims.

Thus, the method according to the invention is characterized in that at least two of the processing means are brought to rotate in opposite directions and essentially horizontally adjacent to another so that the mass at the upper surface of said means is conveyed outwards towards the respective opposite side walls of said vessel, whereby said mass is brought, by several spiral element arranged in an inclined manner at an essentially cylindrical core of the respective processing means, into generally inclined channels delimited by said core, by said walls at respective two adjacent spiral elements and by said vessel's wall portions adjacent to the respective spiral element, and further towards a constriction or choke formed by the respective intermeshing spiral elements at adjacent processing means.

Favorably the method comprises bringing a part of said mass to be pressed against at least one outlet arranged in said

vessel, by controlling the spiral elements rotation and pitch around said core and/or the vessel's inlet and/or outlet parameters, the rest of said mass being pressed, suitably under the impact of at least one gable end of said vessel and/or the impact of the spirals acting in an intermeshed manner, through said channels and into a direction away from said outlet and/or up over the upper surface of said processing means to join the mass being fed into the process.

A method according to another embodiment of the invention, especially arranged for treatment of couch mass, is characterized in bringing at least two essentially vertically arranged spiral cylinders of said mixing arrangement to rotate in an intermeshed manner counter to each other so that mass dropping down will be transported by said spirals outwards against the respective outer sides of the couch pit, where said mass is drawn in into channels formed by adjacent spirals, by the respective core bodies of said cylinders and by a wall of said trough so that said mass will be conveyed towards a constriction formed by said cylinder cores and the mutual intermesh of said spirals, whereby a portion of said mass will be pressed towards an outlet, a portion of said mass will circulate in channels formed at said constriction and surplus mass will be pressed backwards through said channels.

According to a favorable embodiment of the method the amount of dilution water is controlled according to the width of the down-falling paper web constituting said couch mass, suitably to obtain a consistency corresponding to the consistency of the fresh stock in a paper manufacturing process and suitably so that the stock is returned to a mass processor without a preceding thickening. Hereby the returned amount is suitably restricted to a pre-defined proportion of the total stock while any surplus amount suitably will be fed to a collecting tank and/or so that, at a change in the paper machine, the level in said couch pit is restricted to a minimum by controlling the rotation of said spiral cylinders, by choking said

outlet or in another way.

The arrangement according to the invention is especially characterized in that said cylinder means comprise at least two cylinders arranged for rotation counter to each other, respective spiral means extending directly from the surface of each respective cylinder core to the vicinity of a respective wall section of said vessel, said cylinders being arranged so that said spiral means at least in pairs intermesh to define generally inclined horizontal channels having a smaller cross section that those channels which at each respective cylinder are formed between adjacent spirals, said cylinder core and a wall section of said vessel.

The direction of rotation for each respective cylinder is suitably such that the mass at least at the outermost cylinders is pressed by the spiral means against the side walls of the vessel and downwards along them towards a favorably respective semi-circular portion of the vessel and suitably towards the vessel's outlet and, respectively, towards the vessel's gable walls. The dimensions of the inlet and outlet, respectively, are suitably such that the mass, due to the rotation of said spiral means, is at least partially pressed through said channels in a direction away from the outlet, the system of spirals suitably being so tight that a pressure will be built up in front of the outlet.

According to a favorable embodiment of the invention each respective spiral cylinder comprises a core suitably in the shape of a displacement body having a considerable diameter in relation to the total diameter of the spiral cylinder. The diameter of the body is suitably at least 50 percent, preferably about 75 to 95 percent of the total diameter. The number of spirals on each cylinder is suitably more than one, favorably 4 to 40, where said spirals are arranged in such a manner that their pitch suitably is more than three diameters per turn, the angle (α) between the outer edge of a spiral and

the normal plane perpendicular to the axis of said cylinder then being more than 45°. Said angle α is preferably more than 60°, favorably about 65° to 85°. Said spiral means are suitably arranged around each respective cylinder core along essentially the whole horizontal extent thereof.

According to a favorably embodiment the pitch of the spirals is such that the pitch corresponds to the length of the cylinder on about ½ to 1 turn. Thus the channels formed by said spirals will run from the inlet end of the arrangement almost to the outlet end thereof, in certain cases the whole way. The spirals according to the invention may in this favorable embodiment be defined as several parallel screws arranged on a common core, and here it is reason to note that these spirals, in contrast to prior art, have such a shape and pitch that the processed material in practice cannot keep up with the spiral pitch, and that the spirals are not, at first hand, used for transportation of material but for accomplishing a mixing. The spirals do not normally gear into each other in a mutual contact, but instead an effective mixing action is achieved by pressing the material between the spirals and in the form of a leaking between the spiral edges and the vessel's walls.

According to an alternative embodiment the shape of the spirals is such that the spirals comprise a triangular or in another manner essentially two-dimensional cross section, while the embodiment disclosed in the appended figures comprises essentially blade-like structures. The dimensioning and individual structure of the spirals is suitably adapted according to the material to be processed, so that the spirals at the rotation do not to any essential degree bring air with them, while simultaneously the material to be processed has time to flow in between the spirals.

According to one embodiment of the invention the spiral cylinders are arranged in pairs and are rotatable so that said

cylinders at the outer sides thereof, which sides are directed towards the vessel's wall, together with said wall or, respectively, at the area between any possibly existing adjacent other pairs of cylinders form a nip or wedge-shaped inlets for the mass, suitably so that each respective nip or wedge-shaped portion comprises a shearing/cutting edge portion co-acting with the spiral edge. According to another embodiment more than two spiral cylinders are arranged to interact suitably in pairs.

In the figures different embodiments ar shown where the number of outlets varies. According to one embodiment the number of outlets is greater than one, whereby the spiral cylinders suitably are divided in sections, each leading to a respective outlet. According to another embodiment the outlet is centrally located, the spiral cylinders then suitably being divided in sections, each leading toward the center. According to a further embodiment each respective outlet is centrally located between the cylinders of the respective interacting pair of cylinders.

According to the invention a flow or flows to be homogenized is/are processed so that they are conveyed to a vessel or trough, on the bottom of which spiral shaped sets formed as intermeshing spiral cylinders rotate and feed the mass towards one or several outlet opening(s). The spiral cylinders, consisting of a cylindrical core and spirals closely attached thereto, are brought to rotate so that their upper sides move away from each other, whereby said mass will be conveyed the outer way around the spiral cylinders towards their under side(s). Here the intermeshing of the spirals will form a choked portion which partially prevents the mass from following the rotation of the spiral cylinder, and thus the mass will be pressed, by the spiral movement of the spiral, towards an outlet located under the spiral cylinders at their end.

The direction into which the mass will be pressed by the

rotating spiral is the spiral's pitch direction, the spiral pitch being the distance between the spiral turns in the axial direction of the spiral cylinder. The higher the pitch the more acute the spiral angle will be, which angle is formed between the outer edges of the spirals and a normal plane imagined with respect to the axis of the spiral cylinder.

Traditional spiral conveyors usually have a pitch corresponding to one spiral diameter or less for each turn. In such a case the spiral angle will be 17.5° or less, the action of the spiral being, above all, forwarding in the direction of the axis, the mixing impact being insignificant. According to the present invention a mixing action is achieved by pressing the mass against a constriction between the cylinders and thus the mass is forced to flow through the channels formed by said spirals and said core or said vessel, and especially in a direction opposite to the spiral's aforesaid forwarding direction. In order to intensify this impact the spirals are suitably given a higher pitch so that said spiral angle α is 45° or suitably even more, corresponding to a pitch of about 3 times the spiral diameter or more. An especially good efficiency is achieved for spiral angles of 60° or more, corresponding to a pitch of 5.5 times the spiral diameter or more.

If one wishes to have more than one outlet the spiral cylinders ar divided into sections having different pitch angles, so that mass will be conveyed to each of said outlets. Such outlets may be arranged at both ends of the spiral cylinders, or centrally. For centrally arranged outlets the spiral sections are favorably chosen so that the pitch of the spiral sections meet at the outlet which thus will be fed from two directions.

By utilizing multiple spirals multiple flow channels are achieved. By letting the outer edge of the spirals extend into near vicinity of the core of an adjacent spiral cylinder the

accessible volume for each unit of angle at the meshing point of the spirals will be half of the same in their free portion. Simultaneously a labyrinth is achieved which prevents the mass from leaving the flow channels, and thus any surplus mass not received by the outlet will be forced to flow backwards along the channels in a direction which, thus, will be opposite to the direction in which the spirals at an open rotation would convey the mass.

The sides and/or the bottom of said vessel or trough are suitably shaped into a form which rather closely follows, at least for a part of the circumference, the periphery of the spiral cylinders. The trough around the spirals is favorably shaped to have semi-cylindric bottom sections so that the outer edge of the spirals adjacent to the outlet will pass closely near the trough in a sector corresponding to at least the distance between two spirals. Correspondingly, the spiral ends favorably are arranged so that they pass near the trough gable. Thus, at least one spiral at each side will press mass towards the outlet.

Since only a portion of the mass can rotate along with the spirals, that portion of the rest of the mass which is not conveyed towards the outlet openings will be forced into an opposite direction along channels formed by the spirals. The flow of mass will be accelerated and shearing forces will appear in the mass. These shearing forces contribute to the disintegration of for example fiber bundles and sheets of paper or other conglomerates of components of the mass to be processed, which components usually are more consistent in relation to the dilution fluid. Simultaneously this partial flow directed counter to the main flow of the mass will contribute to an effective mixing and equalization of the mass composition.

To that part where the channels between the spirals are not closed by the semi-cylindrical sections of the trough the

surplus mass will be forced forwards along the channel and up in the trough, which further makes the mixing in the trough more efficient. By designing said semi-circular sections to cover a greater or lesser portion one can affect the portion of mass being forced backwards through said constriction or, respectively, forwards through the open channels.

If the transition between semi-cylindrical section and the side walls of the trough is made sharp the spirals will, at their rotation beyond this edge, shear off larger pieces of mass located near this edge. This facilitates the treatment of a mass comprising larger continuous sheets, which for instance may be the case at a paper machine where the couch mass has passed through a press.

Since it is desirable to have only a small amount of mass under treatment it is favorable to design the core of the spiral cylinders as a displacement body having a relatively large diameter, favorably at least half the spiral diameter. Especially favorably the core diameter may be about 3/4 of the spiral diameter or more.

The larger the spiral pitch the higher number of spirals the spiral cylinders should comprise in order to achieve the desired channel effect. When the number of spirals is chosen it should be taken into consideration that the distance between the spirals should be selected in relation to the viscosity of the mass and the rotational speed of the spiral cylinders, so that the mass initially will have the time to fill the channels prior to reaching the semi-cylindrical portion of the trough. Typical combinations for the couch mass in a paper machine could be:

Spiral diameter mm	Core diameter mm	Pitch at each turn, mm	Number of spirals on the cylinder
600	300	2000	6
800	600	4000	16
1000	900	6000	40

For the homogenization of other media the dimensions may considerably differ from the above. For instance, at the production of cosmetics much smaller dimensions would be considered.

In the embodiments disclosed in the figures the spirals, as such, are relatively thin, but according to a special embodiment of the invention the spirals are constituted of displacing spirals having a tight fit, suitably so that adjacent spirals acting in an intermeshed manner to a considerable extent, suitably to 50 to 98 percent fill up the void space between the cylinder cores. By such an arrangement an especially efficient mixing can be achieved, since the spirals constitute displacement bodies which totally or partially fill the channels in the constriction between the spiral cylinders. The thus achieved choke or partial choke of the re-flow through the channels in the constriction raise the pressure towards the outlet and bring about an especially forceful processing of the mass which leaks through the channels and the narrow slits between the spirals and the trough.

This corresponds to the action at a pumping with screw pumps having a positive choke, and it can be utilized for feeding the mass forwards through the outlet without separate pumps.

The shredding effect at the flow through the channels can be made more efficient by arranging, as known per se, special shredding means at the spirals and/or at the cores.

A favorable embodiment is achieved with two spiral cylinders which are partially surrounded by a semi-cylindrical section of the trough bottom and side, the spiral cylinders rotating away from each other, viewed from above, so that the treated mass will be pulled outside of the pair of spiral cylinders towards the semi-cylindrical section and further in towards the nip formed where the spirals intermesh.

The spiral cylinders are made so that the gap between them is narrow. Favorably this can be achieved by utilizing multiple spirals and further by providing the spiral cylinders with a cylindrical core. Thus a labyrinth is achieved which prevents the mass from circulating along with the cylinders.

Most preferably the bottom of the trough is designed as semi-cylinders following the shape of the spiral cylinders and having a tangential transition to the trough side, thus constituting a wedge-like inlet. Hereby is achieved a maximally efficient mass introduction and the volume of the trough is minimized. At the same time the emptying is made easier since the spiral cylinder will pass over the trough bottom in its close vicinity. Alternatively, the transition to the trough side can favorably be designed as a sharp edge which together with the spirals constitutes a shearing tool.

In order to facilitate the emptying it is favorable to provide the trough bottom and the spiral cylinders with a slight inclination towards the outlet opening. A favorable inclination is of the order of 1 to 5 percent. A corresponding effect can also be achieved by making the spiral cylinders and/or the spiral elements slightly conical in a corresponding manner.

The outlet opening is suitably located in one end of the trough, near the gable thereof. However, inlet openings may also, as mentioned, be located at both ends, centrally in the through or in another desired manner. If the inlet openings are located elsewhere than from a location at one end, the spiral cylinder is divided into sections having a different direction of the spiral turn, so that the mass is fed towards the outlets.

The arrangement can, as above has been described, be designed and used so that there arises a pressure towards the outlet. In order to achieve a pumping function the spirals are de-

signed, in a manner known to the expert, so that the gap between the spirals is closed or minimized. Herein also the gap between spiral cylinder and trough should be kept small, suitably only a few millimeters.

For controlling the consistency of the disintegrated mass under different processing conditions a dosing of dilution water is suitably used, which is proportional to the portion of total web width which is conveyed to the couch pit. Thereby the consistency of the couch mass can be controlled to approximately correspond to the consistency of the fresh stock fed into the process.

The mass can also be treated by more than two spiral cylinders, in which case it is favorable to arrange the spiral cylinders in pairs so that each pair of spiral cylinders function as described above. Hereby it is favorable to arrange the pairs of spiral cylinders so that they together form a suction nip which draws mass in between the spiral cylinders. If for several spiral cylinders a relatively high pressure level is desired, outlet openings should be arranged separately for each pair of spiral cylinders.

By the invention a compact system is achieved for treating for instance a broke mass of high consistency obtained at the manufacturing of paper. Hereby it will be possible to bring the mass directly from the broke pit back to the process, whereby any delays in the quality adaption can be avoided. Especially favorably this can be performed through a stock preparation according to patent application PCT/FI96/00052 by the same inventor.

In cases where the shredding and disintegration of fibre bundles is especially critical the invention can be combined with a destripper for treating the outgoing flow.

This is illustrated by the following example. If two spiral

cylinders with a diameter of 600 millimeters having a core diameter of 300 millimeters rotates one turn a second the circulation in the spiral cylinders would be totally 563 liters/second for each meter of machine width. At a web break the production of the paper machine, 10 tons/hour, corresponding of a net flow of 70 liters/second at a consistency of 4 percent will be discharged towards the outlet in the pressure direction of the spirals. The circulation is 493 liters/second or 7 times larger than the net flow for each meter of width. This will flow along the channels which provides good mixing efficiency.

One embodiment of the invention will now be described in more detail with reference to the appended drawings wherein

Figure 1 shows a processing arrangement according to the invention, which arrangement is used as a couch pit in a paper machine, corresponding to section B-B in Figure 2,

Figure 2 shows a corresponding processing arrangement seen from above,

Figure 3 shows an embodiment of the processing arrangement having ten spirals arranged on each spiral cylinder, corresponding to section A-A in Figure 1,

Figures 4a and 4 b show corresponding sections in some other embodiments of the processing arrangement,

Figure 5 shows a section of a couch pit having a central outlet,

Figures 6a and 6b show a processing arrangement having two pairs of spiral cylinders, seen from above and, respectively, in section C-C, and

Figure 7 schematically shows the use of the processing arrangement as a couch pit in a paper machine.

Figure 1 discloses a couch pit embodiment comprising a vessel or trough 10 having a discharge 12 at one gable end 16 and a spiral cylinder 20 located near a suitably semi-cylindrical portion i.e. the bottom 11 of said trough 10. Sheets 30 of mass from trimmings at a paper machine fall down into the couch pit where they are collected in the form of a mass generally indicated by reference 32.

Figure 2 discloses a section A-A of said couch pit according to Figure 1 and an arrangement of two spiral cylinders 20, 20', each of which having a core 22 and 22', respectively, and six spirals 24, 24' arranged so that the spirals of said cylinders in the area between said cores 22, 22' intermesh, favorably so that an outer edge of said spiral cylinder's 20 respective spirals 24 will be close to the spiral cylinder's 20' core 22', whereby a gap 28 is formed as disclosed in Figure 3. The shortest distance between said cores 22, 22' constitutes a constriction 26 where said spirals 24, 24' and, respectively, 24" interlace in mutual interdigitation.

The number of spirals 24, 24', 24" may be higher or lower than six for each spiral cylinder. Even though the invention functions with one single spiral on each spiral cylinder, six spirals usually is the most favorable, since these are needed to provide a more efficient labyrinth in said constriction 26. If said spiral cylinder, as disclosed in Figure 4b, is designed to have a relatively larger core, the number of spirals should be higher, favorably up to forty or more, depending on the relationship between the diameters of the spiral and the core.

Said spirals 24, 24', 24" and said cores 22, 22' form, between themselves, channels 35, 35', and together with said semicircular portion 11 of said trough, channels 34. Reference 33

indicates such channels which at least partially comprise portions which are located outside the trough's 10 suitably semicircular portion 11 which essentially closely fits against said spirals 24, 24', 24". Gables 16, 16' are favorably arranged so that the gap between said gables 16, 16' and said spiral cylinders 20, 20' is small, whereby the channels indicated by reference 34 at their ends will be essentially closed by said gables 16, 16'. Thus, the mass conveyed by said spirals towards said nip 25 will have its only outlet through said discharge 12 or said channels 35, 35'. At the end opposite to said discharge said channels 34 will be in direct contact with such channels 33 which are at least partially open and thus allow a flow mainly over the top of said cylinders 20, 20' and in a direction counter to the rotational direction of said spiral cylinder in a direction towards said discharge 12. Here it is to be observed that the references 33, 34 and 35 indicate a relative partition of said channels in accordance with a certain property and in a position disclosed in the respective Figure, and that the properties of each specific channel with respect to openness and constriction will change as the relative positions of the respective channel changes due to the rotation of said cylinder 20.

Seen from above said spiral cylinders 20, 20' rotate outwards, whereby any mass 32 in said channels 33 will be drawn, due to the rotation of each respective spiral cylinder, towards the semi-cylindrical portion 11 of said trough and into channels 34 and further to an inner nip 25 where the spirals 24, 24', 24" intermesh, and further towards said constriction 26. Due to the spiral movement of said cylinders said mass 32 will be conveyed favorably towards the discharge end of said couch pit 10, at which end the level of said mass 32 will rise so that a return flow 36 is formed. In the channels referred to as 34, 34' closest to said gable 16 the gable will prevent said mass 32 from flowing forwards, and thus surplus mass will flow backwards instead as channel flows 38 along channels referred

to as 35, 35' through said constriction 26. After having passed said constriction 26 the speed of said mass will slow down so that the mass flow will fill up said channels. Hereby the return flow 36 at the surface of said mass 32 will be conveyed over said channel flows 38 which among others contributes to preventing mass sheets 32 from being drawn directly to said discharge 12 prior to their being subjected to a sufficient mixing and shredding at said spiral cylinders 20, 20'.

To that part where said channels 34 are not shut by said gable 16 the mass 32 which does not follow the rotation of said spiral cylinders will favorably be forced forwards along said channels 34 towards the discharge end to said open channels 33 and will again be drawn towards said constriction 26. If the volume of the spiral structure itself is relatively small and frictional losses are discounted the portion of mass flowing forwards would be 2/3 in the present case, while the portion flowing backwards would be 1/3 of the total amount of mass circulating. If the spirals are more displacing the amount of mass flowing forwards correspondingly increases.

During operation trimmings from the paper machine will fall as sheets 30 of paper mass down into said trough 10, whereby they are conveyed by the rotating spiral cylinders 20, 20' towards a nip 37 at the transition between the sides 14 of said trough 10 and its bottom 11 and onwards towards said constriction 26 between said spiral cylinders 20, 20'. When a sufficient amount of mass has been gathered in said trough 10, the space between said spirals 24, 24', 24" at said spiral cylinders 20, 20' will be filled with mass 32. Due to the rotation such mass which is located in said channels 33, 34 of said spirals will be conveyed towards said constriction 26 whereby the available channel volume between said spirals 24, 24', 24" will be reduced to about one half.

Figure 2 discloses a pair of spiral cylinders 20, 20' seen from above and shows how spirals 24, 24' having opposite

rotational directions intermesh. When a spiral cylinder is chosen one should take into consideration to leave a sufficiently large free surface between the spirals so that the broke actually falls in into said channels 33 between said spirals and thus can be drawn with them into said channels 34.

Figures 4a and 4b disclose other embodiments of e.g. a couch pit designed in accordance with the invention, said pit being designed to have an increased height. In Figure 4a said spiral cylinders comprise ten spirals, in Figure 4b twenty spirals each. The higher couch pits contain a buffer capacity for broke mass and they can be operated according to the same principles as conventional couch pits, i.e. with a level control and variable discharge pumping. Especially Figure 4a shows how the transition between the side 14 and the semi-cylindrical bottom 11 of the trough 10 is designed to have a sharp edge against which said spirals 24 can cut sheets of mass. The embodiment according to Figure 4b is especially favorable since the high volume cores 22, 22' will displace mass, whereby the amount of mass in the treatment arrangement is kept small.

Figure 5 shows, as an example, a couch pit having a central discharge. The spirals 24 are designed to have two sections 120, 120' having different turning directions so that they force the mass towards a centrally located discharge 12'. The Figure shows the situation during a web broke when in addition to trimmings 30 also broke 31 will fall into the couch pit which is loaded over its whole width. In a break situation the flow through the couch pit will increase to a multiple of normal operation. Then it may be favorable also to increase the rotational speed of the spiral cylinders and thereby also their shredding and pumping efficiency. For this reason they are favorable provided with a driving device having a variable rotation. For controlling the operation of the arrangement in may also be favorable to provide each respective discharge, and in some cases also each respective inlet, with choke means

(not shown), thus facilitating the control of the essential operative parameters of the arrangement.

Since the removal of mass through the discharge is less than the conveyor capacity of the spiral cylinders 20, 20', mass 32 will be pressed through said constriction 26 an the gaps at the spiral cylinders, which brings about a collection of mass on top of the spiral cylinders. Also on the upper side said spiral cylinders will convey mass 32 generally towards the location of said discharge 12 which will bring about a level rise there and further to a recirculation of the surface mass, which causes broke and trimmings to be conveyed especially away from said discharge prior to their being drawn into said channels 34. Thereby they will pass through a large portion of the spiral which enhances the probability that fibre bundles and lumps of mass will be subjected to shredding and thus disintegrated. The same effect can also be seen in Figure 1, even though the falling mass here is conveyed towards one end of the trough.

In cases where a broad couch pit is needed it is favorable to use more than two spiral cylinders, as disclosed in Figure 6. In this case four cylinders have been arranged. It is favorable to arrange the spiral cylinders in pairs 45, 45' so that the nip 27 which is formed between the most central cylinders and where said cylinders draw mass downwards is made so broad that it does not prevent the movement of the mass in the same manner as said constrictions 26 in the upwards leading nips. When several pairs 45, 45' of cylinders is applied it is favorable to arrange separate discharges 12" for each pair of cylinders, whereby said pairs 45, 45' of cylinders can build up a pressure in front of the respective discharge 12" and effectively convey the mass 32 towards it.

Figure 7 discloses a favorable use of a processing arrangement according to the invention as a couch pit in connection with a paper making process where the paper machine is supplied with

mass from a compact stock preparation 50 according to patent application PCT/FI96/00052 by the same inventor. Stock is pumped to the short circulation of the machine by a stock pump 51, which is controlled so that the dry flow of stock over a sensor 52 is kept at a desired level. The stock is diluted in a conventional manner in a mixer pump 53 and fed over a cyclone cleaner 55 and a screen 57 to the headbox 59 and a wire section 61. Backwater draining from the wire section is distributed into partial flows in accordance with Finnish Patent No. 89728 by the same inventor and fed back to the process through air separating pumps 72 according to Finnish Patent Application No. 935853 by the same inventor. Surplus water is fed over a level box 65 to fibre recovery 66.

Trimmings 30 and broke 31 falling down at the paper production are brought over a wire guide roller 56 wherefrom they are dropped into the couch pit 10 by a doctor blade 58. Dilution water for diluting the couch mass is fed by a dilution water conduct 60, the amount of water being controlled by a valve 62 controlled by a flow regulator 64 so that the amount of water is kept proportional in relation to the amount of couch mass fed. The dilution water is favorably filtered or clear water from fibre recovery 66. By selecting the consistency of the diluted couch mass so that it corresponds to the consistency of the fed fresh stock one achieves that the water from the fibre recovery 66 in all situations of operation is sufficient for the dilution, no water reservoir being needed for this purpose.

During normal operation the diluted couch mass is pumped by a pump 54 to stock preparation 59. At a web break the amount of couch mass will increase and thus also the flow of dilution water, whereby at least a part of the increased amount is fed to a broke container 68. Favorably this is done with a broke pump 55, while the pump 54 can be dimensioned for less flow. The discharge flow from the couch pit 10 is favorably controlled so that the level in the couch pit is maintained, by a

pump 54, constant up to a pre-defined maximum variable flow, while the broke pump 55 is started immediately when the capacity of said pump 54 has been exceeded so that a pre-defined maximum level has been exceeded, in which case the level control is taken over by said broke pump 55 until said maximum level has been recovered.

The invention has been described mainly as applied to paper making and treatment of couch mass in connection thereto. The use of the invention is, however, not restricted to said application, but it can also be extended to many other situations. Thus, the invention can be utilized in production and returning of, e.g., chemical engineering products, concrete, etc.

Above some favorable embodiments of the invention have been discussed but for the expert it is clear that the invention can be varied in many other ways within the scope of the appended claims.

Claims

1. A method for treating a fluid mass (32) wherein a mass material (30, 31, 32, 60) is fed to a vessel or trough (10) having a mixing device comprising rotatably arranged processing means (20, 20'), wherein at least two of said processing means (20, 20') are brought to rotate in opposite directions and essentially horizontally adjacent to one another, c h a r a c t e r i z e d in conveying said mass (32) at the upper surface of said means (20, 20') out towards said vessel's (10) respective opposite portions (11, 14), which portions are delimited in the radial direction of said processing means, and bringing said mass (32), utilizing several spiral elements (24, 24') arranged in an inclined manner at an essentially cylindrical core (22, 22') of each respective processing means (20, 20'), into horizontal channels (34 - 35) arranged in a generally inclined manner, which channels (34 - 35) are defined by said core (22, 22'), by opposite wall portions of respectively two adjacent spiral elements (24, 24') and by said vessel's (10) wall portions (11) adjacent to the respective spiral elements (24, 24') and further towards a constriction (26) formed by the respective intermeshed spiral elements (24, 24') at adjacent processing means (20, 20').

2. A method as defined in claim 1, c h a r a c t e r i z e d in bringing a part of said mass to be forced towards at least one discharge (12, 12', 12") arranged in said vessel (10), by controlling the rotation of said spiral elements (24, 24') and, respectively, their pitch around said core (22, 22') and/or the inlet and/or outlet parameters for said vessel (10), while the rest (36, 38) of said mass is forced, suitably under the impact of at least one gable wall (16) of said vessel (10) and/or the impact of said spirals (24, 24') working counter to each other in an intermeshed manner, through said channels (35) and in a direction away from said discharge (12, 12', 12") and/or up (36) over the upper surface of said processing means (20, 20') to be combined with an

added feed of mass (32).

3. A method for treating a couch mass (32) or the like, wherein said couch mass (30, 31, 32) and dilution water (60) is brought to fall down into a couch pit comprising a trough (10) and a mixing arrangement (20), c h a r a c t e r i z e d in bringing at least two essentially horizontally arranged spiral cylinders (20, 20') of said mixing arrangement to rotate in an intermeshed manner counter to each other so that said couch mass (30, 31, 32) falling down is conveyed by spirals (24, 24') out towards respective sides (14) of said couch pit (10) where said mass (32) is drawn into channels (34) formed by adjacent spirals (24, 24'), by the respective cores (22, 22') of said cylinders and by a wall (11) of said trough (10) so that said mass (32) is conveyed towards a constriction (26) formed by said cylinder cores (22, 22') and the intermesh of said spirals (24, 24'), whereby a part of said mass (32) is forced against at least one discharge (12, 12', 12"), a part of said mass (32) is re-circulating in channels (35) formed at said constriction (26) and the surplus (36) is forced back through said channels (35).

4. A method as defined in claim 3, c h a r a c t e r i z e d in controlling (62) the amount of dilution water (60) in accordance with the width of a paper web (30, 31) falling down, which web constitutes said couch mass (32), suitably to a consistency corresponding to the consistency of fresh stock in a paper making process, and favorably so that said mass (32) is returned (54) to a stock processor without a preceding thickening.

5. A method as defined in claim 4, c h a r a c t e r i z e d in restricting the returned (54) amount of mass to a predefined proportion of the total mass amount while the surplus is suitably fed to a collector tank (68) and/or so that the level in said couch pit (10) is restricted at a change in the paper machine to a minimum by controlling the rotation of said

spiral cylinders (20, 20'), the choke of said discharge (12, 12', 12") or in another way.

6. A processor arrangement for a fluid mass (32), said arrangement comprising a vessel or trough (10) for the reception of the respective mass (32), a mixing arrangement arranged in said vessel (10) and comprising horizontally arranged rotatable cylinder means (20) provided with spirals and a discharge (12, 12', 12") for processed mass (32), said cylinder means (20) comprising at least two cylinders (20, 20') arranged for rotation counter each other, c h a r a c - t e r i z e d in that each respective cylinder means (24, 24') extends immediately from the surface of a respective cylinder core (20, 20') to the vicinity of a respective wall portion (11) of said vessel (10), said cylinders (20, 20') being arranged in such a manner that said spiral means (24, 24') at least in pairs intermesh (26) to define generally inclined horizontal channels (35) having a smaller cross section than corresponding channels (34) which at each respective cylinder (20, 20') are formed between adjacent spirals (24, 24', 24"), the core (22, 22') of said cylinder (20, 20') and a wall section (11) of said vessel (10).

7. An arrangement as defined in claim 6, c h a r a c t e - r i z e d in that the direction of rotation for each respective cylinder (20, 20') is such that said mass (32) at least at the outermost cylinders (20, 20') is forced by said spiral means (24, 24') against the side walls (14) of said vessel (10) and down along them towards a favorably semicircular portion (11) of said vessel (10) and suitably towards said discharge (12, 12', 12") of said vessel (10) and, respectively, against gable walls (16) of said vessel (10), whereby the dimensions of said discharge (12, 12', 12") and inlets, respectively, favorably are such that said mass (32), due to the rotation of said spiral means (24, 24') at least partially is forced (36, 38) through said channels (35) in a direction away from said discharge (12, 12', 12"), the spiral system

suitably being so tight that a pressure will be built up in front of said discharge (12, 12', 12").

8. An arrangement as defined in claim 6 or 7, c h a r a c - t e r i z e d in that each respective spiral cylinder (20, 20) comprises a core (22, 22') suitably in the shape of a displacement body having a considerable diameter in relation to the total diameter of said spiral cylinder (20, 20'), suitably at least 50 percent thereof, favorably 75 to 95 percent thereof, the number of spirals (24, 24') at each respective cylinder suitably being more than one, favorably 4 to 40, and said spirals (24, 24') being arranged in such a manner that their pitch suitably is more than 3 diameters for each turn, the angle (α) between the outer edge of said spiral and the normal plane perpendicular to the axis of said cylinder (20, 20') being more than 45°, suitably more than 60°, favorably within 65° to 85°.

9. An arrangement as defined in any one of claims 6 to 8, c h a r a c t e r i z e d in that said spiral means (24, 24') are arranged around the respective cylinder core (22, 22') along essentially the whole horizontal extent thereof.

10. An arrangement as defined in any one of claims 6 to 9, c h a r a c t e r i z e d in that said spiral cylinders (20, 20') are arranged in pairs and rotatable in such a manner that they at their outer side which is directed towards the wall (14) of said vessel (10) together with said wall (14) and, respectively, at an area between any eventual adjacent other pairs of cylinders, constitute a nip (27) or wedge shaped inlets for said mass (32), suitably so that each respective nip (27) or wedge shaped portion comprises a shearing/cutting edge portion which co-acts with an edge of said spiral (24, 24').

11. An arrangement as defined in any one of claims 6 to 10, c h a r a c t e r i z e d in that said spirals (24, 24') are

displacing spirals having a tight fit, suitably so that said spirals (24, 24'), at adjacent spirals working in an intermeshing manner, to a considerable portion, suitably 50 to 98 percent, momentarily fill the space between said cores (22, 22') of said cylinders (20, 20').

12. An arrangement as defined in any one of claims 6 to 11, characterized in that more than two spiral cylinders (20, 20') are arranged for co-action suitably in pairs (45, 45').

13. An arrangement as defined in any one of claims 6 to 12, characterized in that the number of discharges (12, 12', 12") is more than one, said spiral cylinders (20, 20') suitably being divided into sections (120, 120') leading to a respective discharge (12").

14. An arrangement as defined in any one of claims 6 to 13, characterized in that said discharge (12') is centrally arranged, said spiral cylinders (24, 24') suitably being divided into sections (120, 120`) leading to the center.

15. An arrangement as defined in any one of claims 6 to 13, characterized in that said discharge(s) (12, 12', 12") is (are) located centrally between said cylinders (20, 20') in the respective co-acting pair of cylinders (45, 45').

16. An arrangement as defined in any one of claims 6 to 14, characterized in that the sides (14) and/or bottom (11) of said vessel (10) are designed to follow, at least at a portion of the circumference, essentially close to the periphery of said spiral cylinders (20, 20').

17. An arrangement as defined in any one of claims 6 to 15, characterized in that said vessel (10) including said cylinders (20, 20') and/or the bottom (14) of said vessel (10) is arranged to slope towards each respective discharge

(12, 12', 12") at a slope angle of suitably 1 to 5 percent and/or so that said cylinders (20, 20') and/or said spiral elements (24, 24') have a corresponding conicality.

18. The use of an apparatus as defined in any one of claims 6 to 17 as a couch pit in a paper machine or the like.

Fig 1

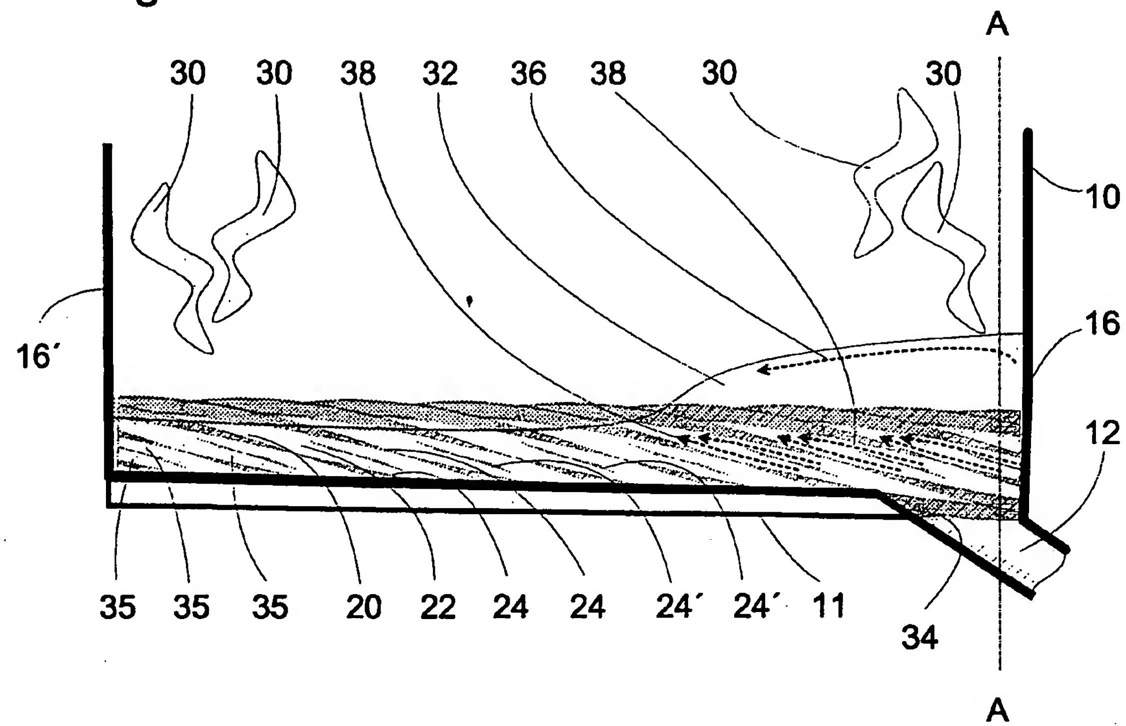

A
30
30
38
32
36
38
30
30
10
16´
16
12
35
35
35
20
22
24
24
24´
24´
11
34
A

Fig 2

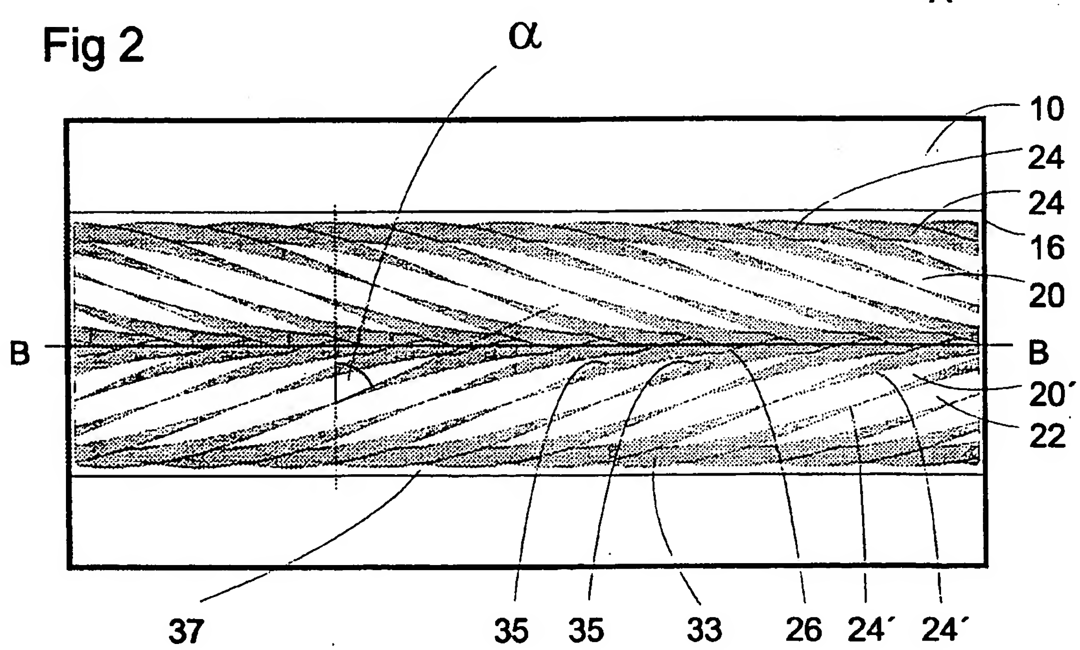

α
10
24
24
16
20
B
B
20´
22
37
35
35
33
26
24´
24´

Fig 3

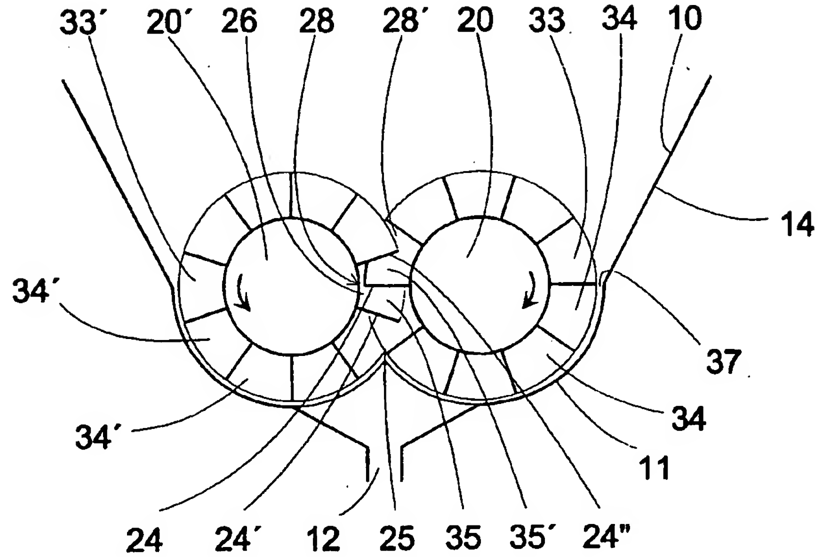


Fig 4a

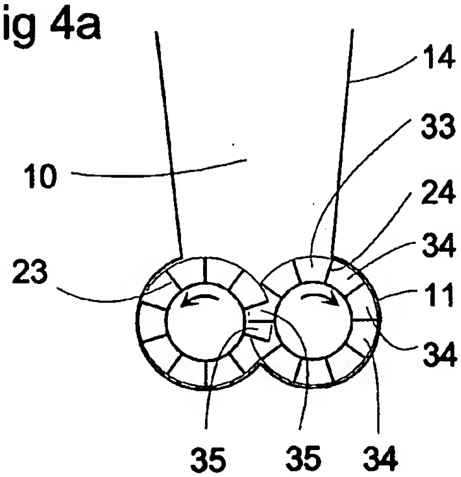
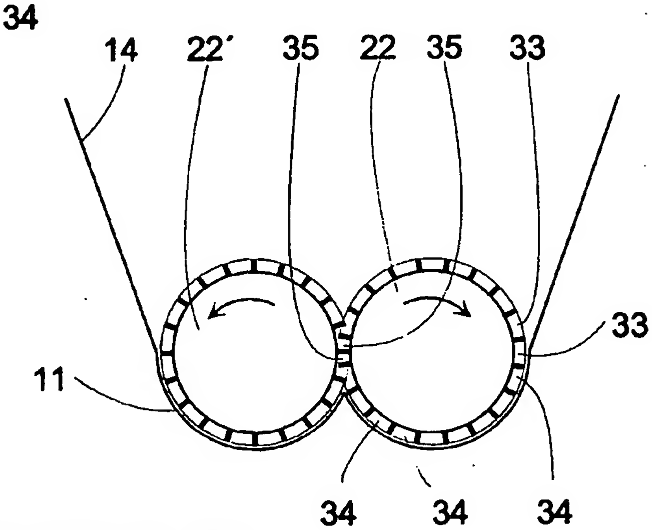


Fig 4b



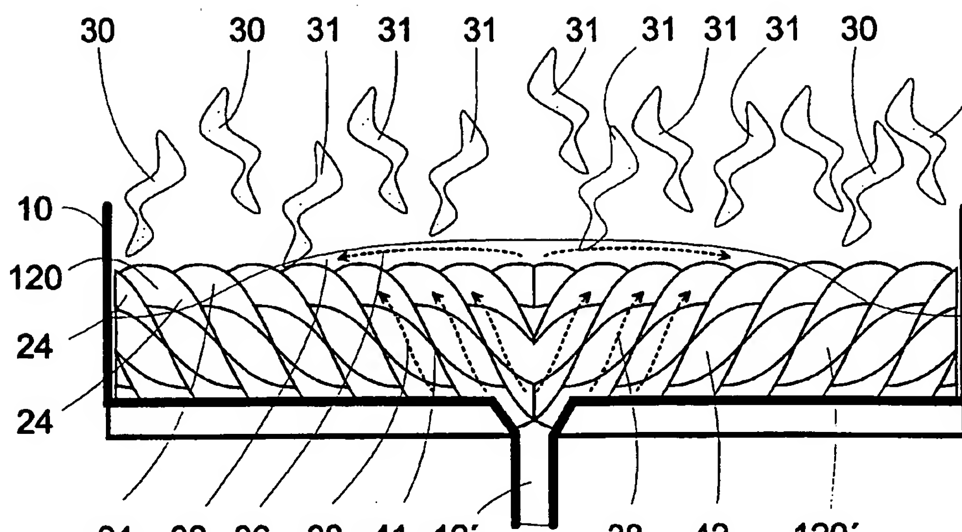


Fig 5

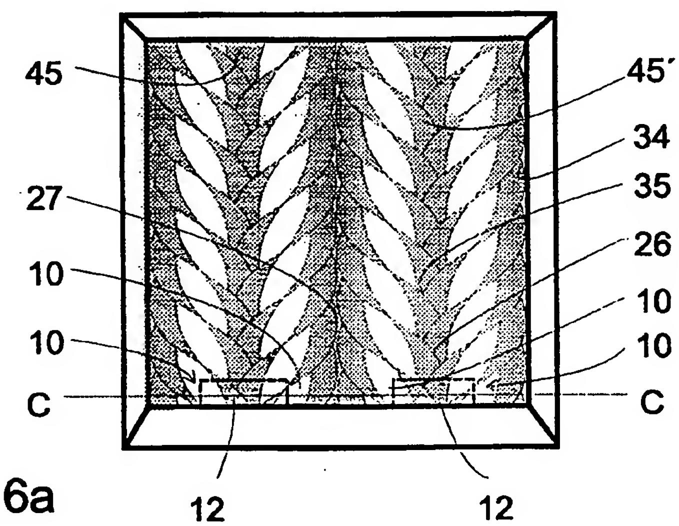


Fig 6a

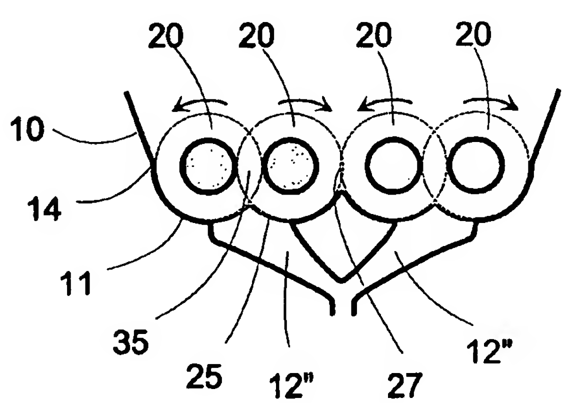


Fig 6b

4/4

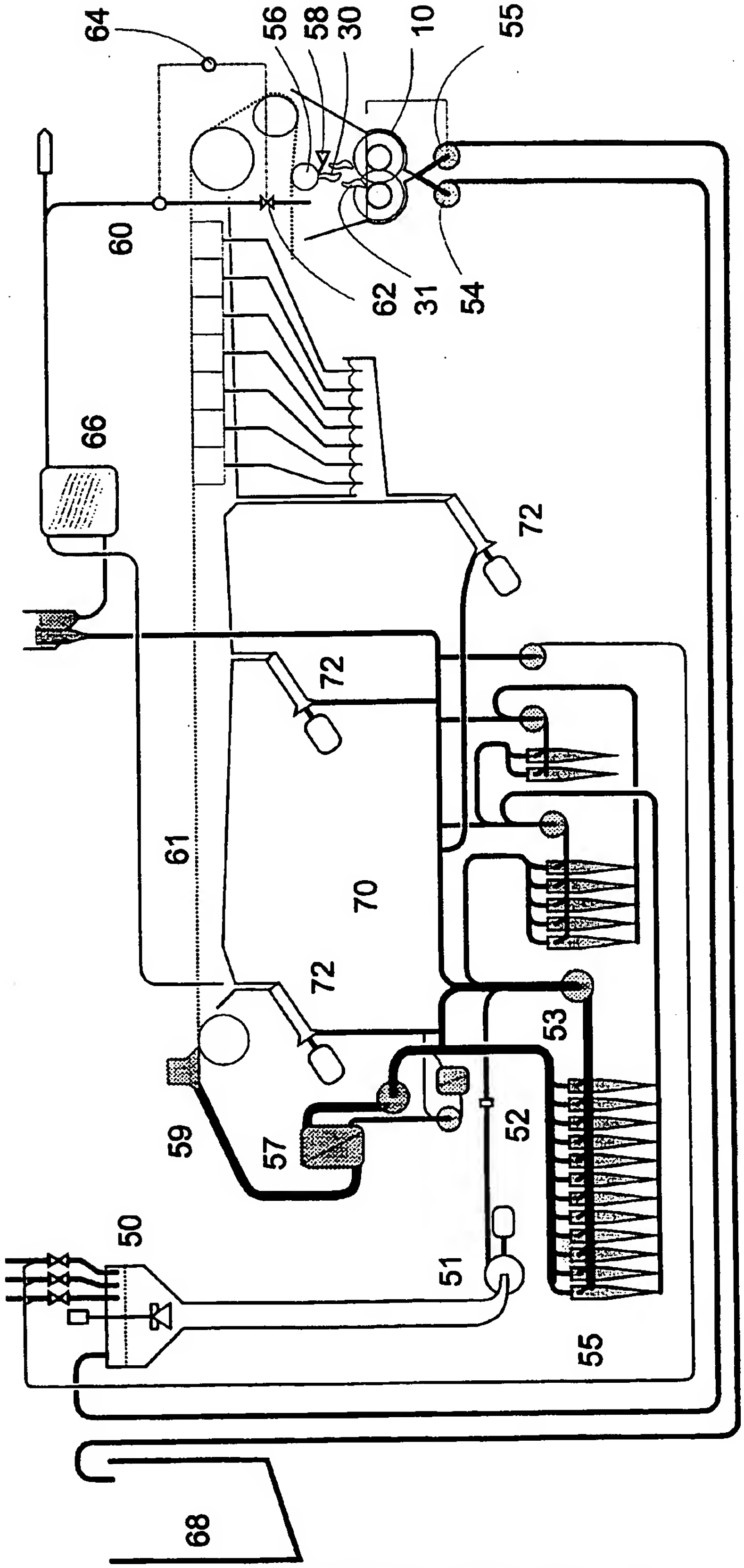


Fig 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 99/00143

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21D 1/02
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: D21D, B02C, B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, PAJ, US FULLTEXT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0144301 A1 (ERIKSSON, FOLKE), 12 June 1985 (12.06.85), figures 2-3, claim 1	1,3
	--	
A	SE 210862 C (AB CALOR & SJÖGREN), 7 February 1967 (07.02.67), page 2, column 1, line 23 - column 1, line 51, figures 1,2	1,3
	--	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" erlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 June 1999	07 -07- 1999
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Wiva Asplund/ELY Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI 99/00143

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0144301 A1	12/06/85	DE 3474846 A	01/12/88
		JP 60139889 A	24/07/85
		SE 447738 B,C	08/12/86
		SE 8306616 A	31/05/85
		US 4732335 A	22/03/88
SE 210862 C	07/02/67	NONE	